

MONONGAHELA LOCK & DAM NO. 7  
River Mile No. 85  
Greensboro  
Greene County  
Pennsylvania

HAER NO. PA-299

HAER  
PA  
30-GREE,  
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
Department of the Interior  
P.O. Box 37127  
Washington, D.C. 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD  
MONONGAHELA LOCK & DAM No. 7

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PA  
30-GREE,  
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HAER No. PA-299

Location: River Mile No. 85, Monongahela River,  
Greensboro, Greene County, Pennsylvania

Date of Construction: 1923-1926

Builder: Dravo Corporation

Current Owner: US Army Corps of Engineers,  
Pittsburgh District

Present Use: Permanently out of service

Significance: Lock & Dam No. 7 are among the  
oldest structures of the  
Monongahela River navigation  
system. The engineering design and  
materials used are typical of lock  
and dam engineering in the United  
States during the 1920s.

Project Information: The Monongahela River Recording Project is  
part of the Historic American Engineering  
Record (HAER), a long-range program to  
document historically significant  
engineering, industrial, and  
transportation sites in the United States.  
A division of the National Park Service,  
U.S. Department of the Interior, the HAER  
program is administered by the Historic  
American Buildings Survey/Historic  
American Engineering Record, Blaine  
Cliver, Chief. Documentation of  
Monongahela River Lock & Dam No. 7 was  
sponsored in 1994 by the U.S. Army Corps  
of Engineers, Pittsburgh District (Fraser  
Gensler, Conrad Weiser, Planning Division,  
Bill Bell, Lockmaster).

The field work, drawings, historical  
reports and photographs were prepared  
under the direction of Eric N. DeLony,  
Chief of HAER, and Dr. Dean Herrin,  
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R. Brian Price (Louisiana Tech University), and Jonathan Gill (ICOMOS/United Kingdom), Architectural Technicians. Formal photography was done by Jet Lowe. Dr. Frances Robb served as project historian. Michael Bennett and Lisa Pfueller Davidson edited and prepared this documentation for transmittal to the Library of Congress.

Additional Monongahela River projects were conducted as part of this 1994 Army Corps of Engineers documentation. See HAER No. PA-385, Monongahela Navigation Company Lock & Dam No. 7; HAER No. 300, Conrail Port Perry Bridge; and HAER No. 304, Lower Monongahela River Public Improvements for additional information. Also, HAER No.'s PA-390 to PA-400 are individual site reports related to the Lower Monongahela River Public Improvements project. A video, "River Mile 85, Mon Lock 7," was also produced as part of the overall documentation (copies are in the possession of the U.S. Army Corps of Engineers, Pittsburgh District, Planning Division).

### Introduction

The Monongahela River runs a 128-mile course from its headwaters at Fairmont, West Virginia, to the Ohio River at Pittsburgh, Pennsylvania. At mile 85, just south of Greensboro, Pennsylvania, Lock No. 7 sits on the west bank of the river. Traveling downstream on the river the lock comes into view only after you turn a bend in the river, then the massive concrete structure dominates the landscape. Tucked into the left bank of the river next to a steep bank is the most noticeable part of the lock, the power house with its vague resemblance to the bow of a boat. The lock chamber itself sits at water level and is difficult to see as it blends into the river, and the mechanics of the lock are completely hidden inside the massive cement walls.

Although the specific components of the lock and dam are not obvious at a casual glance, the lock and dam are an important link in the navigation system of the Monongahela River. Completed in 1925 by the US Army Corps of Engineers, Lock 7 holds a pivotal position on the river. It marks the end of the Appalachian waters of the Monongahela River and the beginning of the flatter territory of the Pennsylvania highlands; it is also representative of a generation of locks and dams built by the Pittsburgh District in the 1920s. In addition, Lock 7 was the focal point of legal battles, as well as historical and technological developments in the navigation of the Monongahela River, one of the busiest commercial rivers in the United States.

With a drainage basin of 7,390 square miles, the Monongahela River area includes the Tygart, Cheat and Youghiogheny rivers among its tributaries, although the Monongahela itself is only 128 miles long. From its headwaters at Fairmont, West Virginia, where the West Fork joins with the Tygart to create the Monongahela, to the mouth of the Ohio at Pittsburgh, Pennsylvania, the Monongahela meanders through mountains and valleys. In its course the river cuts through the famed Pittsburgh coal seam, and provides a logical means of transporting coal to market. From the beginning, coal has been the main commodity carried on the river, and has been largely responsible for the long-term success of the Monongahela navigation system.

Today, there are 25,380 miles of navigable rivers in the United States, all maintained by the federal government, except for the 522 mile New York Barge Canal. From the beginning of the federal government's sponsorship of waterway improvement, the rivers in the Mississippi-Ohio River system have been among the most significant, in terms of development and trade, and the Monongahela ranks among the leaders in this system. In 1928, for example, the Monongahela River carried 27,412,143 tons of

commodities. This amount represented 47 percent of the tonnage carried on the Ohio River and its seventeen tributaries. Even the Mississippi River carried only 18,476,509 tons that year. Consistently, the tonnage carried on the Monongahela River has been enormous, in spite of its relatively short length, earning it the nickname the "Little Giant." Furthermore, as one of the early projects of the Army Corps of Engineers, the Monongahela River slack-water navigation system stands as one of the most successful.<sup>1</sup>

The jobs assigned to the US Army Corps of Engineers are varied. Foremost is its role of military engineering. However, from the earliest days, the assignments carried on by the Corps have long been a mixture of military assignments and civilian engineering jobs. Engineers from the Corps were involved in numerous antebellum transportation projects, including the construction and design of the Cumberland Road, and completing the design and surveys for the Baltimore and Ohio Railroad. Although the Corps sponsored a survey of the Monongahela River to determine the optimum way to improve its navigability in 1833, no action was taken as a result of this report. In 1858 the corps became involved in improving the Great Lakes for shipping, and after the Civil War, its role in waterways development increased. In the 1870s and 1880s the corps was given responsibility for improving the Kanawha River and the portion of the Monongahela River in West Virginia, and the upper Ohio River. Working through the US Army Corps of Engineers, the federal government began to sponsor the improvements of harbors and rivers. Quickly, the Army Corps of Engineers became the largest construction group in the country, leading one journalist to remark that the "conquests of the Corps are as numerous in peace as war."<sup>2</sup>

#### Early Navigation on the Monongahela River

The Monongahela River is one of the triumvirate of rivers, along with the Ohio and Allegheny rivers, that have been so

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<sup>1</sup>The American Waterways Operators, Inc. Big Load Afloat: The History of the Barge and Towing Industry (Arlington, VA: By the Author, 1981), 2, 39; Bureau of Railroad Economics, An Economic Survey of Inland Waterways Transportation in the United States (Washington, DC.: Bureau of Railway Economics, 1930), 222; Waterways Journal (May 3, 1930), 7.

<sup>2</sup>Emerson C. Itschner, The Army Engineers' Contribution to American Defense and Advancement (NY: The Newcomen Society in North America, 1959), 12, 22; Gustav Kobbe, "The United States Engineering Corps," Harper's Weekly (December 9, 1893), 1184; Leland R. Johnson, The Headwaters District: A History of the Pittsburgh District, U.S. Army Corps of Engineers ([Pittsburgh: 1979]), 64-65; [James Veech], A History of the Monongahela Navigation Company (Pittsburgh: Bakewell and Marthans, 1873), 5.

important in the development of Pittsburgh. In large part it was the rivers that allowed the Pittsburgh industries to prosper: it was the rivers that provided inexpensive transportation for the coal and coke to fuel the factories, and the rivers that transported the manufactured goods to rail or markets. The Monongahela River was even used to transport fuel and products between industrial plants along its banks. Together these rivers provided the "nucleus of industrial development" in the region.<sup>3</sup> Once the rivers were improved and released from the seasonal variations dictated by the natural water course, they provided a reliable means of shipping.

Even before navigation was made reliable, the Monongahela River figured prominently in transportation and settlement patterns. Early surveyors, including George Washington, used the Monongahela River as the main link between the eastern Potomac River and the western Ohio River. Although the Monongahela provided an early route, for explorer and settler alike, their travel was impeded by the shallow waters, seasonal flow, and a series of rapids. Despite these shortcomings, farmers and merchants used rafts to float products downriver to Pittsburgh even before man-made improvements to the river.

The stories of the Monongahela navigation system and Pittsburgh industrial development are closely intertwined.<sup>4</sup> It was the valuable coal that provided the impetus to spend the money to improve the river, although additional encouragement came from the construction of the Cumberland Road.<sup>5</sup> Completed in 1818, this road was built by the federal government and it provided the best route across the mountains to the eastern seacoast. It intersected the Monongahela River at Brownsville, Pennsylvania, fifty-five miles south of Pittsburgh. Brownsville was as close as the best road in the nation got to Pittsburgh. Even though river travel between Brownsville and Pittsburgh was sporadic because of the shallow river depths, this was still the

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<sup>3</sup>Corps of Engineers, U.S. Army, Navigation on the Monongahela and Allegheny Rivers (Pittsburgh: Pittsburgh District, Corps of Engineers, 1939), 1.

<sup>4</sup>"Pittsburgh, the Giant Industrial City of the World," Harper's Weekly (May 23, 1903), 853.

<sup>5</sup>Cumberland Road is the official name of this route. However, it is also commonly referred to as the National Road.

best way to ship goods from the seacoast towns to Pittsburgh.<sup>6</sup>

As a means of alleviating this problem, the Pennsylvania legislature passed a bill chartering the Monongahela Navigation Company (MNC) in March 1836. Like most antebellum internal improvement projects the motivation of the directors and investors of the MNC was a classic example of economic nationalism. Much of the early literature of the MNC was cloaked in nationalistic rhetoric that promised great things for the MNC, and the country. Predicting that the navigation route would fulfill the patriotic desire to link the eastern and western sections of the country, and that the improved Monongahela River would offer one of the best ways for people and goods to move to the western territories, the directors declared the project would benefit everyone. Therefore, the MNC would help create a stronger Union, economically and politically, while also enriching its investors. Even though much of this rhetoric was sincere, the main motivating factor for investors remained their belief that the MNC would be a profitable venture. From the beginning, coal factored heavily in this belief.<sup>7</sup>

River improvement schemes, deepening river beds, building canals, and removing obstructions had been prevalent in the eastern United States in the latter part of the eighteenth century. However, since the success of the Erie Canal, completed in 1825, separate canal projects dominated the water portion of internal improvements. The directors of the Monongahela Navigation Company, however, recognized that the wide river bed and meandering course of the Monongahela River were particularly well-suited to a slack-water improvement. Through the placement of dams and corresponding locks, shallow sections would be deepened, and boats could navigate the river throughout the year.<sup>8</sup>

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<sup>6</sup>Catherine Elizabeth Reiser, Pittsburgh's Commercial Development 1800-1850 (Harrisburg, PA: Pennsylvania Historical and Museum Commission, 1951), 62-65.

<sup>7</sup>For more information on nineteenth century internal improvements, and the nationalistic rhetoric that was common see, George Rogers Taylor, The Transportation Revolution (New York: Rinehart and Company, 1957). For specific information on canals and river improvements see, Ronald E. Shaw, Canals For A Nation: The Canal Era in the United States 1790-1860 (Lexington: The University Press of Kentucky, 1990).

<sup>8</sup>Reiser, 60; Glenn Porter and William Mulligan, Jr., Canals and Railroads of the Mid-Atlantic States, 1800-1860 (Wilmington, DE: Eleutherian Mills-Hagley Foundation, Inc., 1981), 3-4.

The planned improvements for the Monongahela, a series of locks and dams between Pittsburgh and the (West) Virginia border, relied on traditional European technology. Although the Egyptian and Babylonian civilizations had built irrigation and navigation dams, the development of the modern pound lock is usually traced to Europe. In the fourteenth century the Dutch had developed rudimentary tidal locks, and by the fifteenth century locks with gates and a means of controlling water in the lock chamber were in use in Holland. Leonardo Da Vinci, working in Italy early in the fifteenth century designed the miter-gate, which formed a "V" when the two gates were closed together, using the pressure of the water to force a tight closure. The seal was assured by resting the gates against a raised sill at the bottom of the lock. By the middle of the sixteenth century the modern pound lock, with two sets of miter-gates at each end, were in use across Europe and Great Britain.<sup>9</sup>

Locks work like stairs for boats, allowing boats to pass from one pool level to the next. In a river improvement scheme, the locks are placed at the same site as the dam. In the Monongahela system, the dams created a pool of water that was deeper than the natural channel, thereby assuring passage during low water periods. Within this requirement the engineers wanted to design a locking process that was easy and fast for boats to use. Throughout most of the antebellum period, American locks used mitered gates, and were hand-operated. Over the years, the basic components of a lock and dam have remained the same, although there have been significant modifications in building materials and the use of technology to operate the locks.

The first navigation improvements on the Monongahela were built by the Monongahela Navigation Company, which was organized in February 1837. With subscriptions taken by the Bank of the United States, the Commonwealth of Pennsylvania, and Pittsburgh investors, the company let contracts for the first two locks and dams in 1838. However, financial troubles besieged the company when both the Bank of the United States and the Commonwealth of Pennsylvania failed to continue subscription payments. All work on the river improvements were halted. In 1843 the state sold all of its shares in transportation companies, including the MNC. Most of this stock was bought by Pittsburgh investors, who believed the coal along the river would make their investment profitable. Work restarted, and in 1844 the first four locks,

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<sup>9</sup>Henry M. Morris and James M. Wiggert, Applied Hydraulics in Engineering (NY: John Wiley and Sons, 1963; Second edition, 1972), 4-5; T.K. Derry and Trevor I. Williams, A Short History of Technology (Oxford, England: Oxford University Press, 1960; Fourth Impression, 1979), 179-188; Norman Smith, A History of Dams (London: Peter Davies, 1971), 265.

between Brownsville and Pittsburgh, were open for navigation.<sup>10</sup>

The antebellum structures built by the MNC differed little from the later works. These timber dams, sometimes referred to as log cabin or crib dams, were among the easiest type to build. The dams were designed by Milnor Roberts, a renowned American canal engineer, for the Monongahela Navigation Company. Cribs of lumber were made on land, and then placed in the river and filled with rubble. As the stone fill was completed, the water behind the dam rose. However, water freely flowed through these timber cribs. The dams were sheathed with a double course of oak plank which was secured to the lower timbers. In addition to easy construction, these dams were considered particularly durable during floods, although they were not impervious to damage by floods and ice. In 1889 representatives of the MNC claimed the crib dams were built on the "very best principle in the construction of dams that we have in the United States." Furthermore, the dams on the Monongahela had been successfully "subjected to greater tests and greater strains than any systems of dams."<sup>11</sup>

The original locks were constructed of locally quarried stone, built on rock bed or oak timbers. Water was let into or out of the lock chamber by sluices placed in the lock walls and floor. In later years under MNC, the locks were modified to improve water flow by placing wickets in the lock gates. These wickets were controlled by rods and levers on the lock wall. The wooden gates were originally placed on iron rails, and moved by chains. Later modifications included fastening the gates to the walls, with bottom pivots. Chains, pulled by a capstan, opened or closed the gates. The early locks were 50 by 190 feet with walls 25 feet high. According to company literature these locks were designed "with special reference to the boats used in the coal trade." With the dimensions of early coal boats 16 feet wide by 75 feet long, there was plenty of room in the lock chamber for

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<sup>10</sup>[Veech], A History of the Monongahela Navigation Company, 7.

<sup>11</sup>Col. T.B. Roberts, Chief Engineer Monongahela Navigation Company in "United States Versus The Monongahela Navigation Company: Before Viewers," Chief of Engineers Pittsburgh District Box #6 E-1308 Papers Related to Monongahela Navigation Company Versus United States Government, Record Group 77, National Archives-Mid Atlantic District, Philadelphia, Pennsylvania; [Veech] A History of the Monongahela Navigation Company, 19-20; C.M. Stewart, "Construction of New Lock No. 6 Monongahela River," (Thesis, Carnegie Institute of Technology, 1920), 1; H.K. Barrows, Water Power Engineering (NY: McGraw-Hill Book Co., 1943), 350.

two barges at once.<sup>12</sup>

### Nineteenth Century River Traffic

When the MNC began building locks in the Monongahela River there was no standard boat or barge size. Flatboats and barges varied dramatically in size. Over time, the size of 16 feet by 75 feet, capable of carrying up to 20,000 bushels of coal, became the standard size during the antebellum period. Typically, these barges were tied together in pairs and floated down river. During the Civil War the modern towing system was developed on the Mississippi River. Under this system the size of barges, still wooden and still used in pairs, increased to 26 feet by 170 feet, but now steamers pushed the barges, too. This system was quickly adopted on the Monongahela River.<sup>13</sup>

The original locks built by MNC, 50 feet by 190 feet, were not large enough to accommodate two of the newer barges with larger dimensions, and the Pittsburgh coal operators frequently complained about this limitation. Even so, the locks on the Monongahela River were considerably larger than any of the canals built during the same period. The locks of the famed Erie Canal measured only 15 feet by 90 feet, and most other antebellum American canals copied these dimensions, including the Pennsylvania Mainline Canal. The Lehigh Canal, a slackwater improvement located in eastern Pennsylvania and the predominant carrier of anthracite coal, had locks of 22 feet by 100 feet that were capable of passing barges carrying 150 tons of coal. Compared to other internal improvement projects of its day, slack-water and artificial waterways, the dimensions of the Monongahela Navigation Company locks were gigantic.<sup>14</sup>

Despite the criticisms of the coal operators, the Monongahela River remained the favored method of shipping coal, and the amount of traffic passing through MNC locks quickly warranted the enthusiasm of the investors. Although coal was always an

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<sup>12</sup>"To the Honorable the Senate and House of Representatives of the Congress of the United States of America," in Forty-Fourth Annual Report of the Board of Managers of the Monongahela Navigation Company (Pittsburgh: Smith Brothers, 1885), 3; [Veech], A History of the Monongahela Navigation Company 20-21; John F. Dravo, "Coal Trade of the Monongahela Valley," Year Book and Directory of the Chamber of Commerce (Pittsburgh: Pittsburgh Chamber of Commerce, 1902), 123.

<sup>13</sup>Dravo, "Coal Trade of the Monongahela Valley," 123-124.

<sup>14</sup>Ronald E. Shaw, Canals For A Nation: The Canal Era in the United States 1790-1860 (Lexington, KY: The University Press of Kentucky, 1990), 38, 66, 87-88.

important commodity, the early commerce of the river mirrored that of the unimproved land surrounding the river. Therefore, agricultural products, timber and salt were among other large traffic items. The biggest change in cargo came from the Cumberland Road, when eastern merchandise was waggoned to Brownsville and then floated down river to Pittsburgh and points west. Passengers transferring from stage to boat at Brownsville were also a significant commodity. Brownsville as a road to river transfer center was further augmented by the completion of the Baltimore and Ohio Railroad to Cumberland, Maryland. For eight years, Cumberland was the closest rail connection to Pittsburgh, and travelers and freight were diverted off the road to the river. It was a period of a "glorious harvest for the Slackwater, and the Eastern Division of the National Road."<sup>15</sup>

On canals mule-powered barges were the typical transportation method, however steam boats were common on the Monongahela River. With steam ship yards located in towns along the river, including Brownsville and Elizabeth, by 1820, steamships were carriers on the Monongahela even before it was improved. With the completion of the first four locks, river traffic increased and the ship building industry expanded. In 1846 alone, ship builders put fifty new boats in service on the river. Although the wake of a steamboat was too destructive for a traditional canal, it was an ideal vehicle on the Monongahela River with its long stretches within a pool and the fairly large locks. Although rafts continued to be used on the river, steam boats used in the coal and packet trade became increasingly common.<sup>16</sup>

#### The First Lock and Dam No. 7

Despite the technical success of the Monongahela Navigation Company, and the increase in annual tonnage, the system had its critics. Loudest of these were the coal operators, who complained about the tolls. Choosing to forget the financial problems that beset the coal shipping industry created by irregular shipments on the unimproved river, these operators lobbied in the state legislature for relief from MNC lockage fees. In 1849 the legislature acquiesced to these demands and mandated a reduction of tolls at Locks 3 and 4 for all boats heading to the Ohio

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<sup>15</sup>[Veech], A History of the Monongahela Navigation Company, 9; Reiser, Pittsburgh's Commercial Development, 62; For further illustration of the significance of the Cumberland Road to the Monongahela Navigation Company, see Third through Fifth Annual Report of the Monongahela Navigation Company, 1841-1844.

<sup>16</sup>Johnson, Headwater District, 91; Porter and Mulligan, Canals and Railroads of the Mid-Atlantic States, 4.

River. Despite this victory, the complaints of coal shippers just grew louder and stronger.<sup>17</sup>

Although the charter of the MNC required it to improve the river to the (West) Virginia state line, the company had only completed six locks and dams between Pittsburgh and Rice's Landing, Pennsylvania, before 1860. The seventh lock and dam in the Pennsylvania portion of the river had long been planned to be built down river of Greensboro, at Jacob's Creek. Often plagued by financial shortcomings, the company saw no need to invest money in locks and dams in this little used section of the river. As long as coal remained the primary cargo, the improvements of the river followed the coal fields. And, before the Civil War, the coal mines were still relatively close to Pittsburgh.

After the war, however, the Pittsburgh iron and steel industry prospered and expanded. With it came an increased demand on coal, and eventually coke for the furnaces. Although railroad lines dominated much of the nation's carrying trade, river transportation remained the cheapest way of moving bulky goods, like coal, particularly when the mines were located so close to the river. The coal barges increased in size in order to carry greater amounts of coal. Still traveling in pairs, the barges now measured 26 feet by 170 feet, and carried 26,000 bushels apiece. Furthermore, the demand for coal among Pittsburgh industries was so great that railroads alone could not supply the demand. There was room for both rail and barge in this region and in 1903 an article about Pittsburgh in Harper's Weekly made only one of the many observations that "if it were not for this water system of carriage of fuel the Pittsburgh industries could not exist, the railroads could not begin to carry the product."<sup>18</sup>

As traffic on the Monongahela River expanded there were increased complaints by coal operators against the MNC, and as they saw it, the company's monopoly on river shipments. These cries increased when the federal government began to improve other inland rivers in the United States, most notably the Kanawha River. The Kanawha, like the Monongahela, cuts through rich coal country, and the Pittsburgh coal operators felt they were placed in an unfair disadvantage by the Kanawha improvements. As they pointed out, while the Kanawha coal was shipped on Corps-built locks free of charge, the Monongahela coal still paid tolls to the private MNC. Increasingly vocal, the

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<sup>17</sup>Reiser, Pittsburgh's Commercial Development, 66.

<sup>18</sup>"Pittsburgh, the Giant Industrial City of the World," Harper's Weekly (May 23, 1903), 853; Dravo, "Coal Trade of the Monongahela Valley," 123-124.

Pittsburgh interests saw these tolls as an unfair tax on their product.

The Coal Exchange and Pittsburgh Chamber of Commerce began to see the success of their lobbying efforts when the 1871 Rivers and Harbors Act called for a government-sponsored survey of the Monongahela River from New Geneva, Pennsylvania to Morgantown, West Virginia. This report recommended that three new locks and dams be built, each with a 10.5 feet lift. In the report, the tension between the private MNC and the federal government is clear, as it is filled with numerous proposals and counter proposals. In a final compromise, it was agreed that the MNC would build one lock, Number 7, and the federal government would build Lock 8 in MNC territory at Dunkard's Creek, Pennsylvania and Lock 9 in the federally-controlled waters in West Virginia.

When the government began constructing Lock 8 in 1877, the directors of the MNC reported they would proceed with the construction of Lock 7 even though they still believed, from their experience with Locks 5 and 6, that Lock 7 could not be a financial success until the coal fields were opened. Nonetheless, Lock 7, along with the two government locks, would "extend the navigation to Morgantown, one hundred miles from Pittsburgh, and be a great benefit to the citizens of the Upper Monongahela Valley, and add to the commerce of Pittsburgh."<sup>19</sup>

Lock 7 was planned to be built just below Jacob's Creek, two miles down river from New Geneva, Fayette County, and Greensboro, Greene County. Because the upper end of Pool 6 just reached New Geneva and Greensboro, Greensboro was the shipping center for Greene County residents. Still, there was little development of the coal field beyond Greensboro. Without a navigable river or railroad, there was little financial incentive to open these mines.<sup>20</sup>

Designed for many years, only the perceived lack of traffic and limited financial resources had prevented the company from building Lock and Dam No. 7. Similarly, the site had also been selected years before. Placement of a lock was based on the requirements dictated by the needs of a sturdy lock and dam: a

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<sup>19</sup> Thirty-Seventh Annual Report of the Board of Managers of the Monongahela Navigation Company (1882), 6; Gannett Fleming Corddry and Carpenter, Inc., A History of Navigation Improvements on the Monongahela River (Pittsburgh: U.S. Army Corps of Engineers, Pittsburgh District, 1980), 5-7.

<sup>20</sup> Samuel P. Bates, History of Greene County, Pennsylvania (Chicago: Nelson, Rishforth and CO., 1888), 521, 764-779; Thurston, Directory of the Monongahela and Youghiogheny Valleys, 18.

straight approach into the lock and an appropriate foundation for the dam. At Lock and Dam No. 7 both structures were built on bedrock, near the mouth of Jacob's Creek. The river, not the neighboring communities, dictated the selection of the lock site.<sup>21</sup>

The locks, therefore, had minimum impact on the nearby communities. The policy of the MNC to build houses at the lock site for the supervisor further separated the lock site from a neighboring community. When the first Lock 7 was built the company listed its placement as at Jacob's Creek. There was no town to speak of at the lock, only the house and outbuildings built by the Monongahela Navigation Company. By 1919, however, the lock site was listed as being at Martin, Pennsylvania, even though the town was on the opposite side of the river than the lock. This town owed its existence to the local coal mines, and was developed as a company town, not as a support town for Lock 7.<sup>22</sup>

As the last lock undertaken by the company, Lock 7 reaped the benefits of experience, and was outfitted with new technical apparatus. The company hired Messrs. Harrold and McDonald to build the lock and dam and expected the construction time to take one year. However, high water delayed the work, and construction was still underway in 1883. At that time, the lock walls, built of limestone, were completed "above ordinary high water line for the whole length." The lock was made of locally quarried stone, laid in cement, although the bottom was made of timber, all built on bedrock. As a later built lock, Lock 7 incorporated changes the MNC had made from its original locks. This included allowing water in to the chamber through the wicket gates, which were placed at the lower end of the gate, and operated by rods and levers. The gates were fastened to the wall, and operated with a capstan. The lock chamber measured 50 feet by 159 feet, a suitable size for the packet boats that operated on this section of the river at that time, and the lock lifted boats 9.2 feet

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<sup>21</sup>Thirty-Sixth Annual Report of the Board of Managers of the Monongahela Navigation Company (1876), 6; Thirty-Seventh Annual Report of the Board of Managers of the Monongahela Navigation Company (1877), 5-6; Forty-Third Annual Report of the Board of Managers of the Monongahela Navigation Company (1883), 11; John W. Arras, "Pittsburgh Waterway Improvement Problems," National Waterways VII (October 1929), 59.

<sup>22</sup>"Annual Reports of the War Department, Report of the Chief of Engineers, 1919," 1384. (Hereafter these reports referred to as "Chief of Engineers Report".)

between pool levels.<sup>23</sup>

The crib dam was 521 feet long, and placed near Jacob's Creek, one mile down river from New Geneva and Greensboro. In 1883 the crib sections of the dam had been floated into position and secured. When completed, the dam created a pool 4.81 miles long. In addition to the lock and dam the site also had a frame dwelling for the lock master to live in, and a carpenter shop, all on several acres of land. The MNC spent \$167,829 building Lock and Dam No. 7, and all its structures and machinery at the site.<sup>24</sup> In 1884 the lock and dam were completed, but the Army Corps of Engineers had not yet finished Lock 8 in West Virginia because of appropriation problems. The MNC complained that "little or no revenue can be expected from Lock No. 7 of this company; but its completion is a compliance with all the requirements of our charter."<sup>25</sup>

Throughout its ownership the MNC made constant changes and modifications to the locks and dams, all designed to increase efficiency and company profits. In 1884, the directors reported that changes had been made at Lock 7. These included modifications in the castings under the gates and the pivots the gates sat on. Furthermore, heavier chains were needed for the wickets. Also, a 50 foot long crib had been added for bank protection below the dam abutment, and the channel was dredged. Conveniently, all dredged material was deposited on the top of the dam.<sup>26</sup>

In 1886, two years after the completion of the original Lock 7, the river works owned by the Monongahela Navigation Company included four crib dams with double locks, and three crib dams with single locks. The second chambers were added to Lock 1

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<sup>23</sup>T.P. Roberts, "The Monongahela River: Some of Its Characteristics and Brief Sketch of Methods Undertaken For the Improvement of Its Navigation" Proceedings of the Engineers Society of Western Pennsylvania XXIV (May 1908), 205; Forty-Second Annual Report of the Board of Managers of the Monongahela Navigation Company (1882), 10, 18; Forty-Third Annual Report of the Board of Managers of the Monongahela Navigation Company (1883), 6-7.

<sup>24</sup>"Monongahela Navigation Company," 49th Cong., 2d sess., (1887) H. Exec. Doc. #112, 14, 25; Roberts, "The Monongahela River," 205.

<sup>25</sup>Forty-Third Annual Report of the Board of Managers of the Monongahela Navigation Company (1883), 11-12; Forty-Fourth Annual Report of the Board of Managers of the Monongahela Navigation Company (1884), 6.

<sup>26</sup>Forty-Fifth Annual Report of the Board of Managers of the Monongahela Navigation Company, (1885), 20-21.

through 4 between 1847 and 1886 when increased river traffic necessitated the additions. Locks 5, 6 and 7 remained single locks under MNC ownership as traffic was limited on this section of the river. Overall, the slack-water improvement of the Monongahela River proved a "most wise one," as the river now afforded a "permanent and reliable public highway . . . on which a large carriage of coal and general merchandise takes place."<sup>27</sup>

Without the large coal traffic, which had required the construction of double-chambered locks on the lower Monongahela near Pittsburgh, Lock 7 was a single chamber lock. Built largely for the passenger packets, with shallow drafts of 6 feet or less, these boats could easily pass through the locks between Morgantown, West Virginia, and Pittsburgh. However, with a width of 50 feet, there was room for a pair of barges to pass through the chamber. In 1899, 1,141 steamboats locked through No. 7, evenly split with one-half going up-river and one-half down. That same year, 129 rafts also used Lock 7, as well as 431 coal boats. Tolls at Lock 7 in the 1880s held steady at or near \$2,800 annually. In the same period, Lock 1 performed 22,926 lockages through its locks. Clearly the bulk of the coal trade remained below Lock 7.<sup>28</sup>

#### Legal Challenge: Private or Public Ownership?

With the slackwater navigation completed along the entire Monongahela River, the coal operators and shippers revived and intensified their complaints against the Monongahela Navigation Company, particularly the tolls assessed to use the locks. According to these special interests the tolls were a "tax on commerce." Furthermore, with the federal government sponsoring the river improvement of the upper Monongahela and the Kanawha rivers, the Pittsburgh operators felt the MNC tolls served as "discrimination against one section of the country and its commerce, placing it at a great disadvantage." Again, the Pittsburgh Coal Exchange and Chamber of Commerce led the attacks, including public and private lobbying against the MNC. In the interest of having the federal government purchase the improvements made by the MNC, the Coal Exchange argued that the commerce on the Monongahela River was of national interest since

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<sup>27</sup>"Monongahela River," 67th Cong. 2d sess. (1922) H. Doc. #288, 2.

<sup>28</sup>"Chief of Engineers Reports, 1899," 2376; "Monongahela River, PA," 67th Cong., 2d sess. (1922), H. Doc. #288, 26.

the "item of coal alone...is sufficient in amount to make this stream of great national importance."<sup>29</sup>

In 1888, responding to the lobbying pressure of these parties, Congress finally acted in a manner desired by the shippers. Claiming the "supreme and paramount" right to control the Monongahela River as part of the interstate commerce regulation under Clause 3 Section 8 of the Constitution, the federal government sought to control Lock 7 in its pivotal position. Arguing that since pool 7, created by the dam, affected the Monongahela River in West Virginia, and since the West Virginia portion was clearly under control of the Army Corps of Engineers, then Lock and Dam No. 7 should be condemned and brought into the federal fold. Therefore, Congress authorized the Army Corps of Engineers to purchase Lock and Dam No. 7 from MNC for \$161,733, less than the company had spent building the structure.<sup>30</sup>

The directors of the Monongahela Navigation Company fought the federal government all the way to the United States Supreme Court, maintaining that if "Congress desires that the Company's property shall be taken for the benefit of the coal men" then it must provide just compensation for Lock 7, under nonnegotiable terms dictated by the MNC. Furthermore, according to representatives of the navigation company, "a dam successfully placed is worth more practically, than the mere cost of the work," so the government's offer was woefully inadequate. The largest issue, however, was not the structures, but the state franchise to charge tolls.<sup>31</sup>

While the Pittsburgh Coal Exchange complained that the tolls amounted to a surcharge on southwestern Pennsylvania coal, and that they wanted "equality with the great Kanawha River," and "equity between states," they also complained that the works of

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<sup>29</sup>"Monongahela Navigation Company," 49th Cong., 2d sess. (1887) H. Doc. #112, 3.

<sup>30</sup>U.S. Reports, "Monongahela Navigation Company v. United States," (1893) Vol. 148: 312-345.

<sup>31</sup>"Testimony Relative to Value of Improvements of Monongahela Navigation Company on the Monongahela River, PA," 54th Con., 1st sess. (1895) H. Doc #78; George Shiras, Jr. in "United States Versus the Monongahela Navigation Company: Before Viewers," RG 77, National Archives-Mid Atlantic Region, Philadelphia, PA. (Hereafter referred to as RG 77, NA-Mid Atlantic.)

the MNC were outdated.<sup>32</sup> In response the president of the MNC claimed that the "free navigation of this river would be substantially beneficial to very few, except the owners of coal lands and dealers in coal in the upper pools."<sup>33</sup> In response to the charge of inadequate facilities the president responded:

So far from it being true that the works of this company are inferior in size and capacity and antiquated in construction, we claim to have the grandest slackwater improvement in the United States, which is in excellent condition, and fully equal to all the requirements of the coal trade and other business of the river.<sup>34</sup>

After winding through the federal court system, the case was heard before the October 1892 term of the Supreme Court. There the Supreme Court justices held that the act of incorporation was a contract between the state and the Monongahela Navigation Company, and since a contract could not be set aside, that the MNC was the rightful owner of the property it had built in the Monongahela River. Furthermore, the "assertion by Congress of its purpose to take property does not destroy the state franchise."<sup>35</sup>

In 1897, after a decade of wrangling, the federal government purchased the property of the Monongahela Navigation Company for \$3,761,615; two million dollars for the value of the river's physical improvements, \$160,000 to pay off corporate bonds, and the remainder to reimburse the company for the loss of its franchise. With this transaction completed, beginning July 7, 1897, navigation on the Monongahela was "free," that is no tolls were charged. On July 16, 32 packet boats paraded between Lock 1 and the Ohio River Davis Island Lock in celebration of the river's "emancipation." Now the Army Corps of Engineers controlled the entire slack-water navigation system of the

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<sup>32</sup>"Monongahela Navigation Company," 49th Cong., 2d sess. (1887) H. Exec Doc #112, 3.

<sup>33</sup>"Monongahela Navigation Company," 49th Cong., 2d sess. (1887) H. Exec. Doc. #112, 10.

<sup>34</sup>"To the Honorable the Senate and House of Representatives of the Congress of the United States of America," in Forty-Fourth Annual Report of the Board of Managers of the Monongahela Navigation Company (1885), 3.

<sup>35</sup>U.S. Reports, "Monongahela Navigation Company v. United States," (1893) Vol. 148: 312-345.

Monongahela River.<sup>36</sup>

#### Early Years of Army Corps of Engineers Operation

The locks and dams inherited by the US Army Corps of Engineers were of varying condition and size. Employees on the Monongahela River system complained that the "13 locks and dams are old and weak, comprise wooden and poor masonry structures with crude machinery, and are subjected to a large traffic and very hard service, requiring close watch, much repair and frequently, from threatened conditions or serious breakages, urgent work."<sup>37</sup> For the next thirty years, the Corps spent time and money rebuilding and replacing the locks and dams on the river, and extending river navigation to Fairmont, West Virginia. Despite this, in 1922 there were still three types of locks in operation. Locks 1 through 6 were 56 feet by 360 feet, with double chambers of the same size located at Locks 1 through 5. Locks 10 through 15 were all 56 feet by 182 feet, hand-powered. Locks 7, 8, and 9 had dimensions of 50 feet by 159-160 feet.

Despite the variance in lock chambers and the age of some of the improvements, coal operators were pleased to have the entire system managed by the federal government, primarily because it reduced their costs. Shipping goods by water is most effective for bulky items that do not have to be moved quickly. Coal is an ideal commodity to send via water, and the water route retained its popularity because of the lower shipping rates. At a cost of less than ten cents per ton of coal on the river, barge rates were substantially less than the forty-five cents per ton on the railroad. Although coal operators were pleased with the change in ownership, some landowners next to the locks complained about government employees trespassing on their land.<sup>38</sup>

Generally, except for the lack of tolls, there were few changes regarding the operation of the system under the Corps of Engineers. Most of the MNC employees stayed on and worked for the

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<sup>36</sup>Commonwealth of Pennsylvania, Water Resources Inventory Report: Part IV Navigation (Harrisburg, PA: Water Supply Commission, 1916), 96; Leland R. Johnson, The Headwaters District: A History of the Pittsburgh District, US Army Corps of Engineers ([Pittsburgh: US Army Corps of Engineers, 1979], 141-142; "A Free River" The Pittsburgh Press (Pittsburgh, PA) July 2, 1897; "Monongahela River Free" The Pittsburgh Press (Pittsburgh, PA) July 16, 1897.

<sup>37</sup>"Report Accompanying 3rd Indorsement on Petition of Certain Monongahela River Employees, January 1, 1900," Entry 1281:426, Letters Sent, RG 77, NA-Mid Atlantic.

<sup>38</sup>William L. Sibert, Captain, Corps of Engineers to Hon. E.F. Acheson, December 13, 1902; Entry 1281:150, Letters Sent, RG 77, NA-Mid Atlantic.

Corps. Under the Corps, lockmasters were paid a monthly salary, as well as receiving housing, fuel and light. The salary level varied based on general traffic volume, so the lockmasters at No. 1 and No. 2 received the highest wages (\$110 per month) followed by the lockmasters at No. 3 and No. 4 (\$100 per month). At locks 5, 6, 7, 8, and 9 "where the business is much smaller and suspension of navigation more frequent, the lockmasters get \$75, and the lock tenders generally \$50." In spite of this wage differential, positions at locks 4, 6, 7, 8 and 9 were "more sought after than those at locks 1, 2, 3 and 5."<sup>39</sup>

In 1917, 19,078 tons of goods locked through Lock 7 in addition to the packet trade. Much of this tonnage was sand and gravel. There was, however, a realization the "most extensive coal deposits accessible to the river" were located in pools 7, 8 and 9. The locks in this area, however, were the smaller, older locks, and were considered by both the Corps and the coal operators to be inadequate to handle large amount of coal trade. Changes would have to be made before coal in this region could profitably be mined.<sup>40</sup>

The packet trade that Lock 7 had been designed to carry was decreasing, and in the first decades of the twentieth century coal boats began to dominate the river traffic on this section. Nationally, river traffic of all types decreased dramatically at the beginning of the twentieth century, a victim of railroad competition and ownership. In contrast with this national trend, tonnage on the Monongahela continued to rise, reaching 27,412,143 tons in 1928.

The nature of the commerce, however, changed dramatically. Even though the packet trade had never represented a significant tonnage, it had served an important role in shipping. In the Monongahela Valley, as across most of the country, the common carrier was largely replaced by the railroad. In the 1870s the first railroads were built in the Monongahela Valley, including the Pennsylvania Railroad-owned Pittsburgh, Virginia and Charleston line and the Baltimore and Ohio-controlled Pittsburgh and Connellsville Railway. With the construction of the Monongahela Railway in 1903, at least one rail line followed the Monongahela River from Fairmont, West Virginia, to Pittsburgh,

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<sup>39</sup>Major Charles F. Powell, Corps of Engineers to Hon. E.F. Acheson, March 3, 1900, Entry 1281:451, Letters Sent, RG 77, NA-Mid Atlantic.

<sup>40</sup>"Monongahela River, PA.," 67th Cong., 2d sess. (1922) H. Doc. #288, 5, 10-11, 15, 26-27.

Pennsylvania. These new rail lines quickly dominated the passenger trade along with the general freight traffic, and passenger traffic on the river dropped quickly.<sup>41</sup>

In spite of this change, and unlike other regions in the country, river traffic on the Monongahela continued to increase, with coal the paramount commodity of the river. In 1921, coal accounted for 78 percent of the commerce carried on the river. This increase in tonnage was deceiving though, as it was dominated by private carriers, particularly U.S. Steel, Jones and Laughlin Steel, Pittsburgh Coal Company and power companies. These firms coordinated their shipping needs with both rail and water "in order to best workout its enormous tonnage-moving problems which could not be economically and efficiently handled by either method alone."<sup>42</sup> Therefore, in contrast to the national trend, river commerce on the Monongahela thrived. Like other inland waterways, however, the age of common-carrier packet trade was gone by the 1920s, replaced by the railroad.

#### New Lock and Dam No. 7: River Mile 85

As the demand for coal continued to rise, coal companies devised different ways of getting larger amounts of coal to market. One such means was to increase the dimensions of coal barges. Wooden barges of the nineteenth century had a wide size range, typically between 90 feet and 175 feet in length, and 16 feet to 27 feet wide. Initially, steel barges, built by the same craftsmen, also had a wide range of sizes. However, by 1902 the tows on the river consisted of a tow boat and three barges, each barge 26 feet wide by 175 feet, with an 8 1/2 foot draft. In order for this typical tow to fit into Lock 7 it required each barge to pass through alone, and then the steamer after, or a total of four lockages to pass one coal tow.<sup>43</sup>

In 1902, Thomas P. Roberts, an assistant engineer with the Pittsburgh District of the Army Corps, noted that the improvements contemplated for the Monongahela River included rebuilding the locks above Lock 4 so that several barges would be able to pass through the lock. By 1922, according to a

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<sup>41</sup>Roger B. Saylor, The Railroads of Pennsylvania (State College, PA: Bureau of Business Research College of Business Administration, The Pennsylvania State University, 1964), 15, 91-95.

<sup>42</sup>"Pittsburgh and Water Transportation"National Waterway (August 1929), 15.

<sup>43</sup>Thomas P. Roberts, Assistant Engineer to Messrs. Ernest Law and Co., December 26, 1902, Entry 1281:187, Letters Sent, RG 77, NA-Mid Atlantic.

Congressional report, the need of the Army Corps to correct "certain physical disadvantages of the present locks and dams has become urgent." In 1921 the corps had begun its study of the future needs of Locks 7, 8 and 9, and the following year, it had determined that both Locks 7 and 8 needed to be replaced with larger locks, and Lock 9 could be eliminated entirely.<sup>44</sup>

Surveys and plans for new Lock 7 were drawn-up, and it was decided to move the lock site 2.5 miles up stream of the original lock to the southern edge of Greensboro. Again, this decision was made regarding the river approach to the lock and the suitability of the river bottom for these structures. The nearby location of Greensboro played no apparent role in deciding the placement of the lock and dam.<sup>45</sup>

The design of new Lock 7 was based on the same basic technology of old Lock 7, including miter lock gates. However, significant changes in materials and hydraulic systems reflecting twentieth-century technology made it appear substantially different than old Lock 7.

In 1923 construction of Locks 7 and 8 began. Lock 7 was built under contract by the Dravo Corporation, while Lock 8 was built by hired labor supervised by the Corps of Engineers. Work at both sites was limited to daylight hours, with no work to be done on Sunday, or national holidays, unless approved by the inspector. During the first year of construction at Lock 7 excavation for the lock wall was started and the cofferdam enclosing works were completed. In all, only 8 percent of the project was completed at that time.<sup>46</sup>

In June 1924 Congress failed to pass the river and harbor bill that funded improvement projects, and there was concern in the industry that the project on the Monongahela River might not be completed. However, it was believed that there was "sufficient money on hand to continue building the lock of No. 7, above Greensboro, on the Monongahela River" since the work was being

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<sup>44</sup>Thomas P. Roberts to Messers. Ernest Law and Co., December 26, 1902, Entry 1281:187, Letters Sent, RG 77, NA-Mid Atlantic; "Monongahela River, PA.," 67th Cong., 2d sess. (1922), 5; "Chief of Engineers Report, 1920," 1352; "Chief of Engineers Report, 1921," 1351; "Chief of Engineers Report, 1922," 1372.

<sup>45</sup>"Chief of Engineers Report, 1923," 1233.

<sup>46</sup>"Memorandum, U.S. Engineer Office," March 18, 1923, File 800.15 General Correspondence, Box 35-NA 1719, NA-Mid Atlantic; "Chief of Engineers Report, 1924," 1233.

done under contract. As predicted, work continued, and in 1924, 58 percent of the work was completed. This included the lock walls and part of the guard walls, the power house (also called the operations building) and the penstock lines. By 1925, all the machinery was installed, the esplanade filled and paved and the dam was in place. In addition, land had been purchased for two lock houses and a contract signed for their construction. On November 10, 1925 the new lock was put into operation, with the United States Pennova being the first boat locked through. Estimated at a cost of \$1,161,241, by the time it was finished Lock and Dam No. 7 had cost \$2,622,750 to build.<sup>47</sup>

One of the most significant changes incorporated into new Lock 7 was the use of Portland cement and concrete, replacing stone and timber as building materials. The lock chamber was increased from 50 feet by 159 feet to 56 feet wide and 360 feet long; large enough to hold four coal barges simultaneously. This brought Lock 7 up to the same lock dimensions as Locks 1 through 6. However, Locks 10 through 15 only measured 56 feet by 182 feet. The land wall of the new Lock 7 stretched 643 feet upstream and 371 feet downstream, for a total land wall length of 1,014 feet. The river wall extended 261 feet upstream and 219 feet downstream.<sup>48</sup>

Lock 7 and Lock 8, which used the same design and was built in Point Marion, Pennsylvania, were among the new designs in use on the Monongahela and Allegheny rivers. In addition to the larger chamber, the method of filling the lock chamber was specifically tailored to decrease the time it took to fill. Within each wall, land and river, there was a culvert, 12 feet high and 10 feet wide, with a curved ceiling. Each culvert was outfitted with a filling valve near the upper gate and an emptying valve near the lower gate. To fill the lock chamber, water enters the culverts and flows into the chamber through twenty 3 feet by 4 feet ports on the land and river walls. To empty the chamber, water is dispersed through the outlets along the lower approach and river wall. If a tow was waiting to be locked through on the lower side, water could be discharged solely through the river wall, so the turbulence would not damage the ship or lock. Each of the inlets is 4 feet by 4 feet, with rounded edges, and the discharge outlets are 5 feet by 5 feet. This longitudinal culvert design

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<sup>47</sup>"Monongahela River," Waterways Journal (June 21, 1924), 7; "New Lock Opened," Waterways Journal (November 21, 1925), 9; "Chief of Engineers Report, 1925, 1178; "Chief of Engineers Report, 1925," 1180; "Chief of Engineers Report, 1926," 1171; "Chief of Engineers Report, 1927," 1190; "Chief of Engineers Report, 1930," 1333-1334.

<sup>48</sup>"Chief of Engineers Reports 1921," 1353; "Chief of Engineers Reports, 1926," 1170; "Chief of Engineers Reports, 1927," 1189.

was the most common American lock design, and particularly appropriate when built into a concrete structure, like Lock 7.<sup>49</sup>

Regulating the flow of water through the culverts was critical to the successful operation of a lock. This task was accomplished through the lock valves. On the Monongahela, butterfly valves were used. The large valve, 12 feet high and 10 feet wide, rotated on a horizontal axis, creating an opening through which water flowed in and out of the lock chamber.

Even though the valves were at the heart of a lock's operation, they were not standardized in the United States. The butterfly valve was well-suited to the acidic waters of the Monongahela River. Its large size alone made it more difficult to convert than other valves. By 1924, changes in the design - making the blade and axle of steel and only the frame of cast-iron - further increased its resistance to the acidic water. The butterfly valve was also favored in this region because it had few working parts, and its relative simplicity made it rugged.<sup>50</sup>

Through the years the Pittsburgh District had experimented with several means of operating the valves. Originally direct water power from the dams was used, but this was rejected as it was proven that winter freezes and high water made this system inefficient. Next, the Corps tried to utilize steam power to operate the valves, but found that this too, was unsuccessful as the steam condensed along the long tunnels. Electric power was rejected as they did not want motors subjected to the frequent high water. Lock 7, and most of the later locks built on the Monongahela and Allegheny Rivers, was designed to operate with the use of hydraulic oil pressure. This hydraulic system was preferred because high water did not adversely affected its operation. Operations were curtailed, however, when the water level between the upper and lower pools was less than five feet six inches. When this occurred, in a flood situation, there was not enough differential between the pools for the gravity-feed

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<sup>49</sup> Alfred R. Golze, Handbook of Dam Engineering (NY: Van Nostrand Reinhold Co., 1977), 563-582; US Army Corps of Engineers, Navigation on the Monongahela and Allegheny Rivers, 8-9; Wellons, "Construction and Operation of a Modern River Lock," in National Waterways 6 (January 1929), 57.

<sup>50</sup> John W. Arras, "Pittsburgh Waterway Improvement Problems," National Waterways: The American River and Harbor Authority VII (October 1929), 60-61; American Society of Civil Engineers, Manual of Lock Valves Manuals of Engineering Practice #3. (NY: Committee on Lock Valves Waterways Division, American Society of Civil Engineers, 1930), 72-75; "Design Data and Plans for Butterfly Valves," File 821.132 Box 40, General Correspondence, NA 1719, RG 77, NA-Mid Atlantic.

system to operate. Furthermore, this system was well adapted to slowly move large, heavy items, such as a lock gate.<sup>51</sup>

To begin the operations, the levers are pushed which open the penstock valves. Water then flows down the penstock galley within the land wall, under the operations building across the three turbine wheels. Each of the three turbines has its own penstock, so control can be maintained over which turbine operates. The water activates one of the turbines in the basement, and the turbines power one of the two Aldrich pumps that push oil through the pipes in the closed pressure system. This pressure opens the butterfly filling valve, and water enters the lock chamber. A second set of hydraulic pipe lines operate the gear rack on the lock gates, applying the pressure to open or close the gates. Combining a gravity-fed water system which power the turbines, with a closed-pressure oil system that operate the mechanics of the lock valves and gates, Lock 7 was outfitted with a deceptively simple, efficient operation system.<sup>52</sup>

Besides the turbines and lock gates, virtually all the remaining mechanisms and parts of the lock were hidden inside the massive concrete walls. Typically, in the Pittsburgh District the hydraulic pipe lines were placed on cast-iron brackets within galleries in the concrete walls. The pipes crossed the lock at the middle section of the lock chamber, below the floor level. These hydraulic lines were designed so that a failure in one would not affect the operation of the remaining hydraulic pipes. In addition, the pipe galleries were made large enough for workers to inspect and repair the pipes without having to tear apart the concrete wall.<sup>53</sup>

A water main pipe and an air main pipe were also built into the massive concrete walls. The water was to be used to wash walls, galleries and machinery when needed, particularly after flooding. The air pipe operates the bubblers, which help clear accumulated river matter from the gate areas, and the signal whistles, a means of communicating between the lock and tows.<sup>54</sup>

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<sup>51</sup>Arras, "Pittsburgh Waterway Improvement Problems," 61-62.

<sup>52</sup>Wellons, "Construction and Operation of a Modern River Lock," 57-58.

<sup>53</sup>Wellons, "Construction and Operation of a Modern River Lock," 58; US Army Corps of Engineers, Pittsburgh District, Operations and Maintenance Manual: Lock and Dam 7 Monongahela River (Pittsburgh: 1984), 2-7, 2-16.

<sup>54</sup>Operations and Maintenance Manual, 2-33, 34.

The concrete form of the lock walls also includes recessed spaces for the lock gates, so the gates are flush with the wall when opened. When closed, the gate and miter sill form the end of the lock chamber. There are also recesses in the concrete wall for ladder rungs and fixed mooring bits. Within each culvert there is a recess for bulkheads, above and below each butterfly valve. This feature eased general maintenance as a blade of the valve could be replaced without interrupting operation, although it would slow the filling and emptying time.

At the center of the lock is the operations building, also called the power house. This concrete building measures 68.6 feet long, 26 feet wide and 32.6 feet high. With the exception of the flagpole and the name of the lock and dam, there is no exterior ornamentation on the building. In this regards, it follows other government architecture of the 1920s, particularly that of the US Army. The rounded edge of the upstream side somewhat resembles a boat, a purely functional feature allowing flood waters to pass along the edge of the building with less resistance.

Like other dam power houses, this building's interior is strictly utilitarian, with the floor plan pragmatically arranged to accommodate the turbines and other machinery.<sup>55</sup> In the lowest level are the turbine galleys. Above the turbines there are two additional stories, each with two rooms. On the river level first floor, the larger room on the downstream side houses the pumps and machinery. The upstream, smaller room contains a third back-up, air-driven hydraulic pump that is used during high water, and originally, the steam boiler used for heat.

The second floor contains the lockmaster's office, a storage and workshop area, and an electric air compressor, diesel generator and a hydro-electric generator. Because of the steep grade, the large door in the storage room from this second level opens at road level. Stairs, either the ones inside the operations building or the outdoor case built on the upstream side of the building, provide access to the lock level. This design and layout was also used at the locks built on the Allegheny River in 1920s.<sup>56</sup>

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<sup>55</sup> Charles Evan Fowler, The Ideals of Engineering Architecture (Chicago: Gillette Publishing Company, 1929), 257; Lois Craig and the Staff of the Federal Architecture Project, The Federal Presence: Architecture, Politics, and Symbols in United States Government Building (Cambridge, MA: The MIT Press, 1978), 238, 281.

<sup>56</sup> Wellons, "Construction and Operation of a Modern River Lock," 23-28; "Concise Data: General Outside Interests," Records of Lock and Dam 7 Monongahela River, Records of the Pittsburgh District, Federal Building,

Only two of the turbines were used to operate the lock mechanisms. The third turbine was designed to power the second-floor electric generator for the power house and dwellings. Lock 7 was the first lock to generate its own electricity. This generator became a back-up generator when West Penn Power Company began supplying electricity to the site. Recently the direct-current generator was used to run the capstans, whistle and bubblers.<sup>57</sup>

Two capstans are built into the land wall; one is located upstream of the upper lock gate, the other downstream of the lower lock gate. These are used by barges when the tow has to be broken apart in order to lock through. Barges can be moved into position by their tow boat, and then the capstans are used to pull the barge out of the chamber. The capstans are controlled by hand levers located next to the capstans. The capstan motors and control boxes are among the few components of the lock that are not water-proof, so in a flood they must be removed from the land wall and taken to safer territory.<sup>58</sup>

The new dam at Lock 7 was a gravity concrete mass dam, again a typical design in use in the United States during this period. A fixed-crest style, it is 610 feet long from the river wall to the right bank abutment. The pool created by the dam stretches 5.8 miles, and is maintained at a 9 foot depth. The lock lifts boats past the dam with a lift of 15 feet.<sup>59</sup>

In addition to the lock and dam, two houses were also built. Typically the lockmaster and engine man and their families lived in these houses. Located on the left bank of the river, the houses were between the lock and Greensboro. The first

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Pittsburgh, Pennsylvania.

<sup>57</sup>The actual date of arrival of the commercial power to the lock is uncertain. Archival records note that West Penn began supplying electricity in 1938. However, retired Lockmaster Sheldon McKee noted that the generator was in use for much of his tenure at Lock 7, well into the 1950s and 1960s. According to Mr. McKee, the lock-generated power was barely sufficient for electrical usage at the lock and the houses. This problem was finally solved when commercial power was established at Lock 7 in the 1960s. Richard T. Wiley, Monongahela, The River and Its Region (Butler, PA: The Ziegler Co., 1937), 171; Gauge Book, October 14, 1938, 87, RG 77, NA, Mid-Atlantic; Interview with Frank Battaglini by the author, March 11, 1994.

<sup>58</sup>Operation and Maintenance Manual, 2-37.

<sup>59</sup>US Army Corps of Engineers, Pittsburgh District, Lock and Dam 7 Monongahela River, Pennsylvania: Fifth Periodic Inspection Report (1989), 1.

lockmaster, George Paxton, was transferred down from the original Lock 7, where he had also served as lockmaster.<sup>60</sup>

Although the locks could be operated by one person, it was common to have two lock tenders per shift. As one person operated the levers, the second helped the barge crew tie on to the mooring bits and capstan. In 1938 there were eleven people employed at Lock 7, all civilians. In addition to the lockmaster and one engine man, there were four assistant lockmasters and five lockmen. This staff kept the lock in operation 24 hours a day, 365 days a year. Frequently, during periods of severe weather the tow crews would aid the lock operators by supplying food, and over the years, lock employees developed a particularly favorite cook among the different companies.<sup>61</sup>

In addition to the locking of tows, the staff was also responsible for maintaining the lock. This included the weekly lubricating of the power pumps, moving parts on the penstock valves, the butterfly valve blade axles, all valve controls, the pins of the lock gates and the operating machinery of the lock gates, to name just a few of the parts requiring regular lubrication. In addition, all parts of the lock required semi-annual or annual inspection to insure proper operating condition.<sup>62</sup>

#### Locking A Tow Through Lock 7

In order to lock a tow through the lock, cooperation between boat captains and lock operators was important. As a tow approached the lock, the captain would establish radio contact with the lock operator. The operator would ready the signal lights, which notified traffic from the opposite direction the lock was already engaged with another tow.<sup>63</sup> In order to lock a tow upstream, the operator would engage the emptying valve lever, which allowed water out of the lock chamber until the water level in the chamber was at the same level as the lower pool.

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<sup>60</sup>Gauge Book, January 1921-February 1934, Lock and Dam 7, Monongahela River, RG77, NA-Mid Atlantic.

<sup>61</sup>"Concise Data, Lock 7 Monongahela River," 1520-03, Federal Building, Pittsburgh, Pennsylvania; Wellons, "Construction and Operation of a Modern River Lock," 27; Interview with Bill Bell by the author, May 31, 1994.

<sup>62</sup>Operation and Maintenance Manual, 2-47, 48.

<sup>63</sup>This signal light was installed at the Lock in February 1933. "Monthly Reports of Operations and Progress, 1933," Box 2E-1299: 12-13, RG 77, NA-Mid Atlantic.

Typically, it took one minute to open or close the lock gates, another minute to minute and one half for the valves to adjust.

Then, the operator opened the lower lock gates, and the light signal turned to green when the gates were opened. This light, along with the air whistle, signaled the tow captain that the lock was ready to enter. As a lock employee assisted the barge crew with tying the barge to the mooring pins on the wall, the lower lock gates were closed behind the tow.

Next, the operator switched the emptying levers closed, and opened the filling valves. This raised the water level in the lock chamber. When the level in the chamber reached the same level as the upper pool, after about five minutes, the upper lock gates were opened, the tow untied, and the air whistle engaged to signal to the captain that he could leave the lock. Cooperation between lock employees and boat captains has been a significant part of the locking procedure and it is important the lock operators are familiar enough with the lock and its approach that they can "talk" a new pilot into their lock.<sup>64</sup>

#### Operations and River Traffic

Even with the new locks operating, the project was not considered finished until the old lock and dam had been removed, and the pool adequately dredged. In 1930 only 81 percent of the river work had been completed. The completion of Lock and Dam 7 and 8 raised the pool levels and eliminated the need for old Lock 9. The eradication of one lock simplified and hurried along the coal tows. With the completion of the new locks, Locks 1 through 8 were finally all the same size, 56 feet by 360 feet, although Locks 1 through 6 had double lock chambers. Locks 7 and 8, however, were designed so a second chamber could be added at a later date when warranted by traffic.<sup>65</sup>

The design of Lock 7 met several criteria important to a heavily used river lock. Foremost of these was the attempt to minimize the inconvenience of repairs. For example, the lock gates were designed so that they could be easily replaced or repaired by the Corps' repair boat. The butterfly valve blades could also be replaced without closing the lock. With the bulkheads placed in front and behind the valve, the repair crew could make the necessary corrections. As they were doing this,

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<sup>64</sup>Operations and Maintenance Manual, 2-4-7; Interview with Bill Bell by the author, May 31, 1994; Interview with Frank Battaglini by the author, March 11, 1994.

<sup>65</sup>"Chief of Engineers Report, 1930," 1333.

that specific culvert would be unavailable, but the lock could still function, although locking time would be slowed as it took longer for the chamber to empty or fill. In addition, the hydraulic lines did not interfere with each other, so a break in one did not adversely affect the remaining lines. Furthermore, since the lock could operate with only one functional turbine, during low water periods, two penstocks could be opened in order to get enough water to power the turbine. Also, one turbine could be repaired without closing down the entire lock. In general, the Pittsburgh District found it advantageous to design locks with duplication built in, so the lock's operations could remain in as constant operation as possible.<sup>66</sup>

The interest in minimizing down time for a lock was closely tied to the desire to keep maintenance and repair costs as low as possible. This was quite a significant matter. With fifteen locks and dams on the Monongahela and seven on the Allegheny, these costs were notable. In 1930, for example, the Pittsburgh District replaced or repaired thirty-four steel lock gates, eighteen miter sills, six turbine water wheels, and eight sets of gate operating machinery.<sup>67</sup>

With the construction of Lock 7, along with Lock 8, the Monongahela navigation system was brought up to shipping standards of the day. In fact, the District entertained visitors inspecting locks and dams on the Monongahela. Included among the visitors were two engineers from the Tennessee Valley Authority. They arrived in Pittsburgh in 1935 wanting to inspect the improvements along the Kanawha and Monongahela as representative of the "most highly developed and efficient system of navigation improvements on small inland streams so far developed in the country."<sup>68</sup>

The continual operation of the highly-regarded system was difficult, however and the shippers were a demanding lot to please. Although the increased size of the Lock 7 chamber was welcome news to the river shippers, the users still had complaints about the new lock. One of the first concerns regarded the "dangerous condition" at the entrance and exit of the lock. With the lock placed in a curve of the Monongahela River the

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<sup>66</sup>Navigation on the Monongahela and Allegheny Rivers, 8; Wellons, "Construction and Operation of a Modern River Lock," 27.

<sup>67</sup>Wellons, "Construction and Operation of a Modern River Lock," 23-28.

<sup>68</sup>Arthur E. Morgan to Major General Edward M. Markham, October 23, 1935, File 800.15, RG 77, NA Mid-Atlantic.

short length of the outside wall above the dam made the approach to the lock chamber difficult. This was compounded by the lock's location just downstream from the mouth of the Cheat River, which was subject to rapid rise in the river level. According to the River Manager of Vesta Coal Company (a Jones and Laughlin Steel subsidiary), unless additional walls were built the lock would not be "safe to enter at any time, and if not repaired immediately...there will be very serious damage done to Lock and Steamer."<sup>69</sup>

The Pittsburgh Coal Exchange went so far as to call Lock 7 "absolutely the most dangerous place in the Monongahela River." In fact, according to the Coal Exchange, pilots had been instructed not to enter the lock with a full tow after dark if the river was running high, but instead to break the tow and make two trips.<sup>70</sup>

In an attempt to rectify this problem, the Corps extended the guide wall at Lock 7 two hundred feet. The Pittsburgh Coal Exchange reported that this improved the situation, but not enough; they still wanted an additional extension of one hundred to two hundred feet to correct the hazardous situation. The entrance to Lock 7 continued to be of serious concern among river users. Finally, in 1934 an allotment of \$17,347 was made for the guard wall to be extended.<sup>71</sup>

A more serious crisis was faced by the Pittsburgh District just three years after Lock 7 was opened when a severe drought threatened river navigation. In the summer of 1930 drought conditions lowered the river water level, and the pool levels of 5, 6, and 7, the "heart of the Pittsburgh district," in particular had reached critical levels. In an unusual measure of cooperation, navigation on the Monongahela River was maintained only after agreements were made with local power companies, particularly West Penn Power. As the owners of Lake Lynn, a reservoir on the Cheat River, built to generate power, West Penn Power agreed to release enough lake water to maintain navigation on the Monongahela River. However, in doing this, West Penn jeopardized its ability to produce electricity for its customers.

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<sup>69</sup>P.C. Elsey, Master of Transportation, The Vesta Coal Company, to Jarvis J. Bain, District Engineer, June 25, 1927, General Correspondence, Lock and Dam 7 Monongahela River, Federal Building, Pittsburgh, Pennsylvania.

<sup>70</sup>Pittsburgh Coal Exchange to Lt. Col. George Spalding, Division Engineer, February 24, 1930, File 800.21 Box 36, RG 77, NA-Mid Atlantic.

<sup>71</sup>Fifth Periodic Inspection Report, E-1.

With the assurance from Duquesne Light Company that it would supply power as needed to West Penn, West Penn agreed to make weekly water releases to allow navigation to continue unimpeded.

With this cooperation between private companies and the Corps of Engineers a serious shipping crisis on the Monongahela River was averted. The federally sponsored Tygart River Reservoir project was approved soon after the 1930 drought crisis, and its completion in 1938 "assured an adequate water supply for the Monongahela River navigation," without having to enlist the cooperation of private companies.<sup>72</sup>

Even without natural disasters like droughts and floods, operating and maintaining the navigation system was an expensive and constant job. Although Lock 7 had been designed to keep maintenance costs to the lowest possible point, operating and maintaining the lock was still an expensive proposition. For example, in 1935, just ten years after the lock was opened, the butterfly valves and frames were replaced. This cost just under \$20,000 for this repair alone, and involved 25 laborers working from a derrick boat. In addition, in the decade since the lock had been opened, repairs had been made to the lock chamber, the lock gate machinery, and additional bank protection was put in place.<sup>73</sup>

One of the recurring problems at Lock 7 was the quality of the concrete used in the structure. The poor quality and bad mixture of cement commonly used during the construction period required constant attention. Between 1940 and 1942 the lock was closed for a total of five months in order to repair concrete.<sup>74</sup>

Whenever possible these repairs were coordinated with the coal operators to minimize the disruption of river traffic. However, since traffic used the river all year, there was no ideal time to schedule repairs. In April 1947, for example, the lock had to be closed for three weeks to repair valves, lock sills, pipe

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<sup>72</sup>"When Power Aids Navigation," National Waterways IX (October 1930), 38-40; "Allegheny and Monongahela Rivers and Tributaries," 83rd Cong., 2d sess., H. Doc. #491 (1954), 49.

<sup>73</sup>Memorandum from I.C. Bell to District Engineer, January 31, 1935, Box 1/1 E-1305, RG 77, NA-Mid Atlantic.

<sup>74</sup>Memorandum on Repair Work, from L. E. Laurich, May 25, 1940, Monongahela River Lock and Dam 7, File 11-2-240, Operation and Maintenance General, Records of the Pittsburgh District, Federal Building, Pittsburgh, Pennsylvania; Fifth Periodic Inspection, 2.

crossings, and upper guide wall. In a letter to companies using Lock 7 the District Engineer reminded them that the work "consists of urgent and vitally needed repairs to various parts of the lock structure which cannot be further deferred." Despite these closures, many other repairs, including repairing butterfly valves, could be done without interrupting traffic through the lock because of the lock's design.<sup>75</sup> Repairs in 1957 were scheduled in order to "utilize the miner's holiday as part of the lock repair period."<sup>76</sup>

Most of the repair work was confined to regular maintenance and replacement needed when parts wore out. However, some of the repair work was required because of the damage done to the lock by the steel barges. In an attempt to better protect the walls from such damage, gunite was applied to lock walls as a means of protecting the concrete in 1958. That same year, the upper guard cell required repair work that included two steel sheet piles and one hundred linear feet of fender timbers after being damaged by a tow. This one job cost over \$22,000. The following year, edge armor was applied to the upper guide and land walls.<sup>77</sup> As early as the 1930s the Pittsburgh Coal Exchange had requested a mooring cell be added above Lock 7. However, it was not until 1969 that the Corps approved this construction, noting the continued "damages to the upper guard cells and timber fenders." The \$25,000 appropriation for its construction was made in 1969, and the cells were built the following year.<sup>78</sup>

In spite of all these attempts to keep operational costs low, it was increasingly expensive to maintain the navigation system. Although annual repairs for Lock 7 could be as low as \$163 to repair gate machinery in 1933, they also could go as high as

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<sup>75</sup>"Notice to Navigation Interests," Memorandum April 1947; "Authority to Close Locks Nos. 7 and 8, Monongahela River for Repairs," July 1941, Monongahela River Lock and Dam 7, Operation and Maintenance General, Records of the Pittsburgh District, Federal Building, Pittsburgh, Pennsylvania.

<sup>76</sup>"Notice to Navigation Interests," Memorandum from Roy S. Kelley, Colonel, Corps of Engineers, May 17, 1957, Monongahela River Lock and Dam 7: Operation and Maintenance General, 11-2-240, Records of the Pittsburgh District, Federal Building, Pittsburgh, Pennsylvania.

<sup>77</sup>Fifth Periodic Inspection Report, 2, E-1.

<sup>78</sup>"Additional Funds, Monongahela River," Memorandum from Wayne S. Nichols, Colonel, Corps of Engineers, November 10, 1969, Monongahela River Lock and Dam 7, File 1520; "Upper Guard Cells-Dravo Corporation, Contract #DA-36-050, June 1958," Monongahela River Lock and Dam, File 1220-03, Records of the Pittsburgh District, Federal Building, Pittsburgh, Pennsylvania.

\$352,374, to replace lower gates in 1980, a significant increase even when the inflationary difference between 1933 and 1980 is taken into account. These costs reflect repair jobs only, and do not include the personnel costs required to keep the lock operational.<sup>79</sup>

One of the most significant changes at the site came in 1978 when the government removed one of the dwelling houses associated with Lock 7. The second house was removed ten years later after it was determined that "the deterioration of this structure has resulted in excessive operating and maintenance costs."<sup>80</sup>

#### Change on the River and Obsolescence

Even though Lock 7 was larger than the first lock 7, coal operators complained almost from the first day of its opening about its small size. In 1937 the Pittsburgh Coal Exchange requested the Corps begin the process of enlarging locks 6 and 7. At that time the District Engineer reported that "traffic does not justify the erection of a larger lock at this location at present time." However, twenty years later as maintenance costs continued to rise, concrete continued to crumble, and as coal barges again increased their size, the Corps did embark on a feasibility study to replace Lock 7.<sup>81</sup>

In 1953 a government report noted that the "coal resources of the lower Monongahela River Valley are becoming depleted and the center of coal production is gradually moving upstream." Therefore, future replacements would be needed for Locks 7 and 8, enlarging their lock chambers to the new standard of 720 feet by 84 feet. Although Lock 7 had been designed and built for a second chamber, it was determined that the location of Lock 7 was not ideally suited for a second chamber, and an entire new lock structure would allow for an increase in lock chamber size. Even though this report recognized the shortcomings with Lock 7, most

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<sup>79</sup>Fifth Periodic Inspection Report, E-1. It is the author's opinion that with the use of automobiles, houses near the lock became less critical, but evidence supporting this theory was not available. Unfortunately a more in-depth analysis of the dwellings provided for lock employees was not possible within the scope of this study.

<sup>80</sup>File 1520-03 Monongahela River Lock and Dam 37, Misc. Specifications; File 11-2-240a Monongahela River Lock and Dam #7, Land Utilization Report, Records of the Pittsburgh District, Federal Building, Pittsburgh, Pennsylvania.

<sup>81</sup>Lt. Col. W.E.R. Covell, District Engineer, to The Pittsburgh Coal Exchange, Report of Program and Recommendations, File 800.21 Box 36, NA 1719, RG 77, NA-Mid Atlantic.

notably its small lock chamber and placement, its replacement was given a fairly low priority, being ranked six out of seven proposed projects. Therefore, although its shortcomings were recognized, any replacement or improvement of Lock 7 was essentially shelved until the other projects were completed.<sup>82</sup>

In 1970 a second study also recommended the replacement of Lock 7, but no action was taken because of court challenges at other Corps projects on the Mississippi River. By 1981, deteriorated, old and crumbling, Locks 7 and 8 were considered the most critical spots in the river system. In addition to the concrete spalling, it was determined that virtually all the land monoliths "failed to meet stability criteria" for even normal operating conditions. Also, the compressed air system was considered out-dated and too slow, and there were structural cracks throughout the concrete, including in the river wall pipe gallery. Furthermore, soundings and diver reports revealed that extensive scouring was occurring under the concrete apron of the dam.<sup>83</sup>

In addition, new safety standards had been implemented in the sixty years since Lock 7 was built. For example, the stationary mooring bits required government and barge employees to handle ropes between the lock wall and barge. A new lock would be equipped with floating mooring bits, eliminating the need for a government employee to handle barge ropes. Also, Lock 7 had no way to close the lock in an emergency. When it was built, temporary bulkheads were designed for installation during repair jobs, and were cumbersome to install. A new lock could rectify this with the addition of permanent bulkheads that could be lowered in place quickly in an emergency.<sup>84</sup>

Another factor regarding the obsolescence of Lock 7 pertained to the size of coal barges. With another increase of coal barges to 35 feet by 195 feet, the capstan units were unable to haul large tows. Also with the larger barges it was no longer possible to fit two barges in the lock chamber together. Delay in shipments became more common as more tows were required to break

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<sup>82</sup>"Allegheny and Monongahela Rivers and Tributaries," 83rd Cong., 2d sess., H. Doc. #491, 54-55.

<sup>83</sup>Pittsburgh District, Army Corps of Engineers, Monongahela River Navigation System Pennsylvania and West Virginia Locks and Dams 7 and 8 Feasibility Study (1984), 3-6; Gannett Fleming Corddry and Carpenter, A History of Navigation Improvements on the Monongahela River, 40.

<sup>84</sup>Feasibility Study, B-4, 7, 8, 9.

apart in order to pass through the lock chamber. It can take a tow with the new barges over one hour to pass through Lock 7. Furthermore, replacement parts for the sixty year old lock had become harder and harder to find.<sup>85</sup>

The two options for the Corps were to repair Lock 7 or replace it with a completely new lock. Since Lock 7 was a single lock chamber, the extensive repairs needed by the lock would require at least three years. Furthermore, as a single chamber facility, this would mean the lock would be completely closed for 10 months during the construction process. Although commercial use of the river was declining, due in large measure to the closing of steel mills in Pittsburgh, the tonnage on the Monongahela continues to be among the highest of all inland waterways in the United States. Furthermore, the Corps argued that "continuing this navigation service in the future is essential to the economic and social well being of the region." The Pittsburgh District, therefore, recommended a new lock be built to replace Lock 7.<sup>86</sup>

The new lock, Grays Landing, is located near the site of the original lock built by Monongahela Navigation Company (scheduled for 1996 completion). It will be 84 feet by 720 feet, allowing a full tow to fit into the lock chamber at one time. It will also allow the lockage to be faster and safer. Grays Landing and the new lock at Point Marion, replacing Lock 8, the sister Lock of 7, are the first two locks in the district to be partially funded by the Inland Waterways Association. This organization, the descendant of the federal government's Federal Barge Line, will pay for one-half of the construction cost of these locks out of an industry-supported tax on diesel fuel. Once again, as was the case with old and new Lock 7, the selection of the Grays Landing lock and dam site was based upon building and navigational requirements, not on any nearby town.<sup>87</sup>

Lock 7 operated until recently on the Monongahela River as one of the oldest generations of lock and dams built by the US Army Corps of Engineers. Well-suited to the coal trade of 1925 when it opened, this elegant unit was an integral part of the navigation system. However, changes in the coal shipping industry made this lock obsolete. Furthermore, as the coal mines moved upriver, Lock 7 saw an increase in the amount of coal passing

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<sup>85</sup>Feasibility Study, B-9, 14; Interview with Frank Battaglini by the author, March 11, 1994.

<sup>86</sup>Feasibility Study, 18-22.

<sup>87</sup>Interview with Bill Bell by the author, May 31, 1994.

through its chambers. In 1950 only 14 percent of the Monongahela River traffic passed through Lock 7. By 1980 that had increased to 24 percent of river traffic. The shift of the coal industry to mines further up river has had a dramatic impact on the nearby community of Greensboro. As local mines were closed, jobs were lost, and the economic base of the community declined. The closing of Lock 7 will not be nearly as dramatic, as the lock was a self-contained unit, and interacted more with the river traffic than the local community.<sup>88</sup>

Since 1897 the Army Corps of Engineers has maintained the navigation system on the Monongahela River. In order to achieve this position, the original Lock 7 was the focus of a pivotal court battle challenging the role of the state and federal government. Years after purchasing the navigation system from the Monongahela Navigation Company, the US Army Corps of Engineers replaced old Lock 7 with a newer, larger Lock 7. Today, this Lock 7 remains as testimony of the magnificent, practical river locks built by the Pittsburgh District of the Army Corps of Engineers in the 1920s. This self-contained unit, with its use of concrete, longitudinal tunnels, butterfly valves and its chamber size were all dictated by the era in which it was built. Over seventy years after its construction, Lock 7 was put permanently out of service. Its replacement was required in order to accommodate the changes in the shipping of coal, and to meet the standards of a later generation.

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<sup>88</sup> Feasibility Study, J-21.

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